

(File Analog Computers)

See EAI

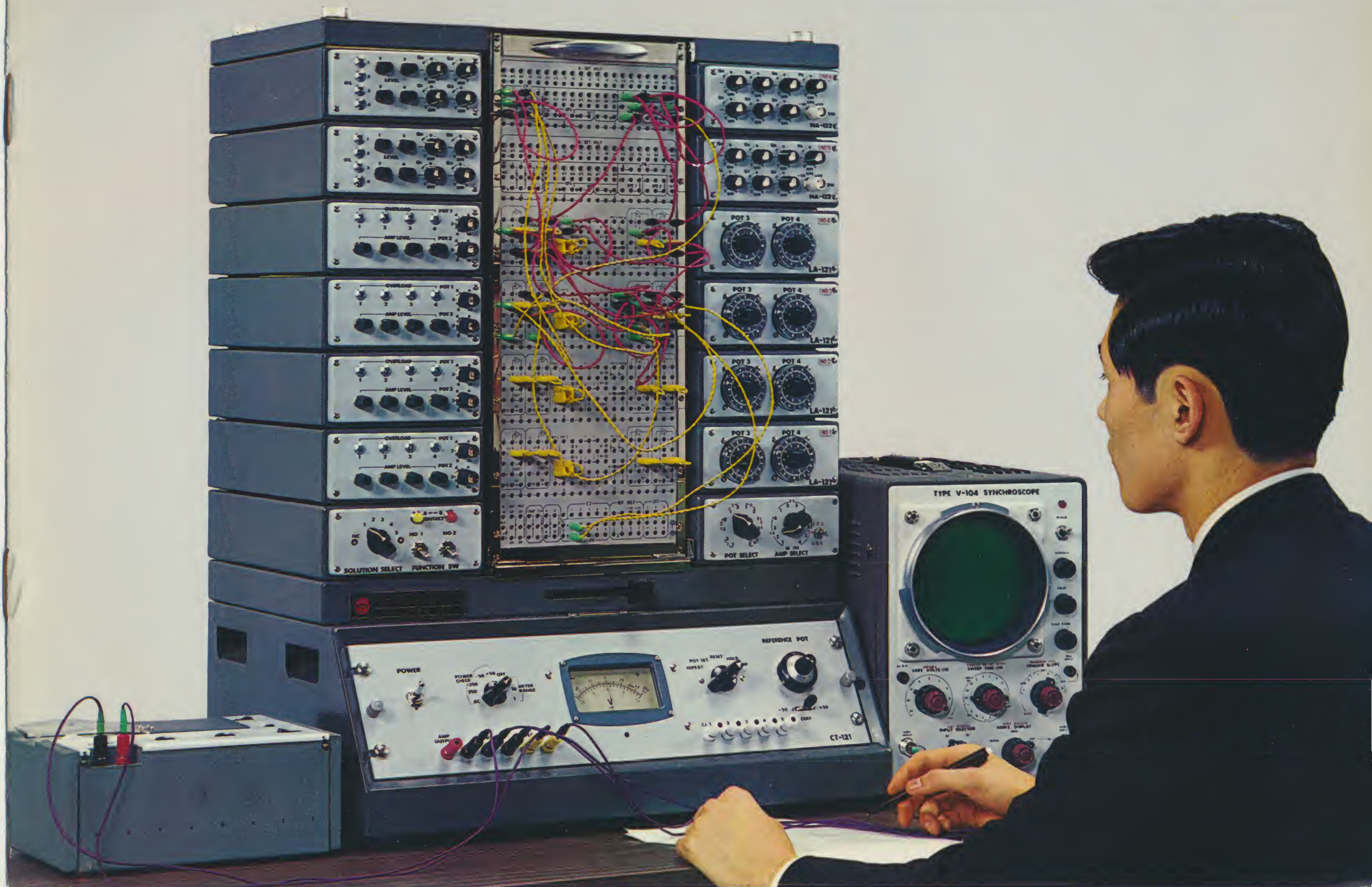
8880 (CRT) Display

under

CRTs & Oscilloscopes

HITACHI 303

analog computer

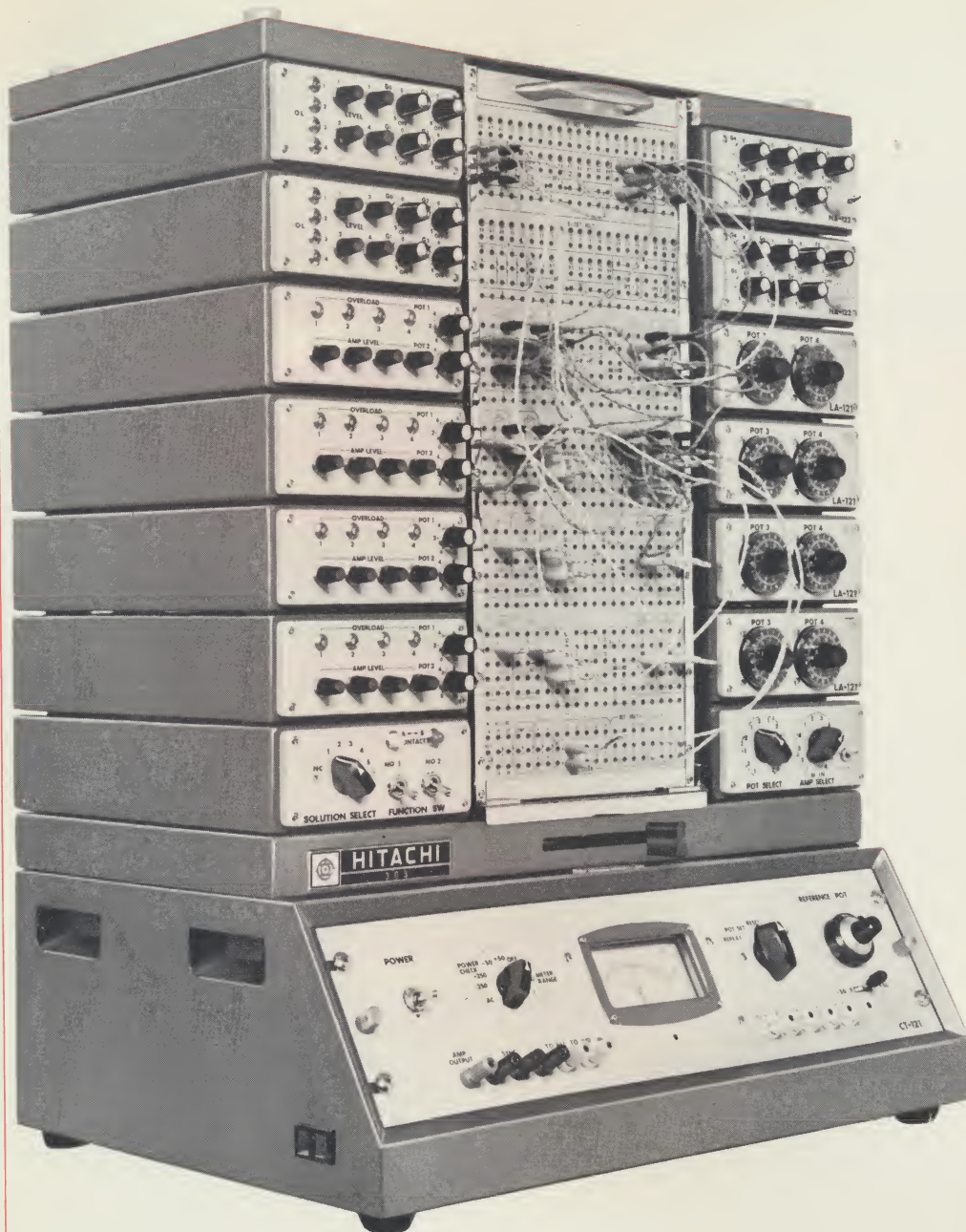


Introduction

The Hitachi 303 is a small size, desk top type Analog Computer. In spite of its size, it is possible to select more than 10 varieties of models according to the computing capacities ranging from a minimum of 4 amplifiers to a maximum of 24 amplifiers. In maximum composition it is possible to analyze differential equations of the 12th order or other complicated equations equivalent to it.

The Hitachi 303 has been designed not only for engineers and scientists, but is also suitable for educators as well. The computer is designed so as to assist educators in increasing educational efficacy by presenting the operational principles of this analog computer and solutions to representative mathematical problems to the students. In order to raise the educational efficacy still further, the pre-patch board system, which is a rare feature for a small computer, is adopted so that many students can perform experiments at one time on one computer.

Repetitive operation is provided for facilitating parameter optimization required at the time of system simulation and model building, and it is possible to indicate the solution on the cathode ray tube at the rate of 8 cps. A real time computation is available for highly accurate analysis.



Put yourself in this position.....

It's easy to see why the Analog Computer is so simple to operate.

Conveniently located and precision made.

Quick, easy preparation.....

Reset the patch board.....

Turn the knob under the overload lamp when it lights.

Presto! Preparation's completed!

Dimensions:	Width	21 $\frac{3}{4}$ "
	Height	30"
		(Fully expanded to 6 panels)
	Depth	16"
Weight:		121 lbs (Fully expanded)

Standard Composition

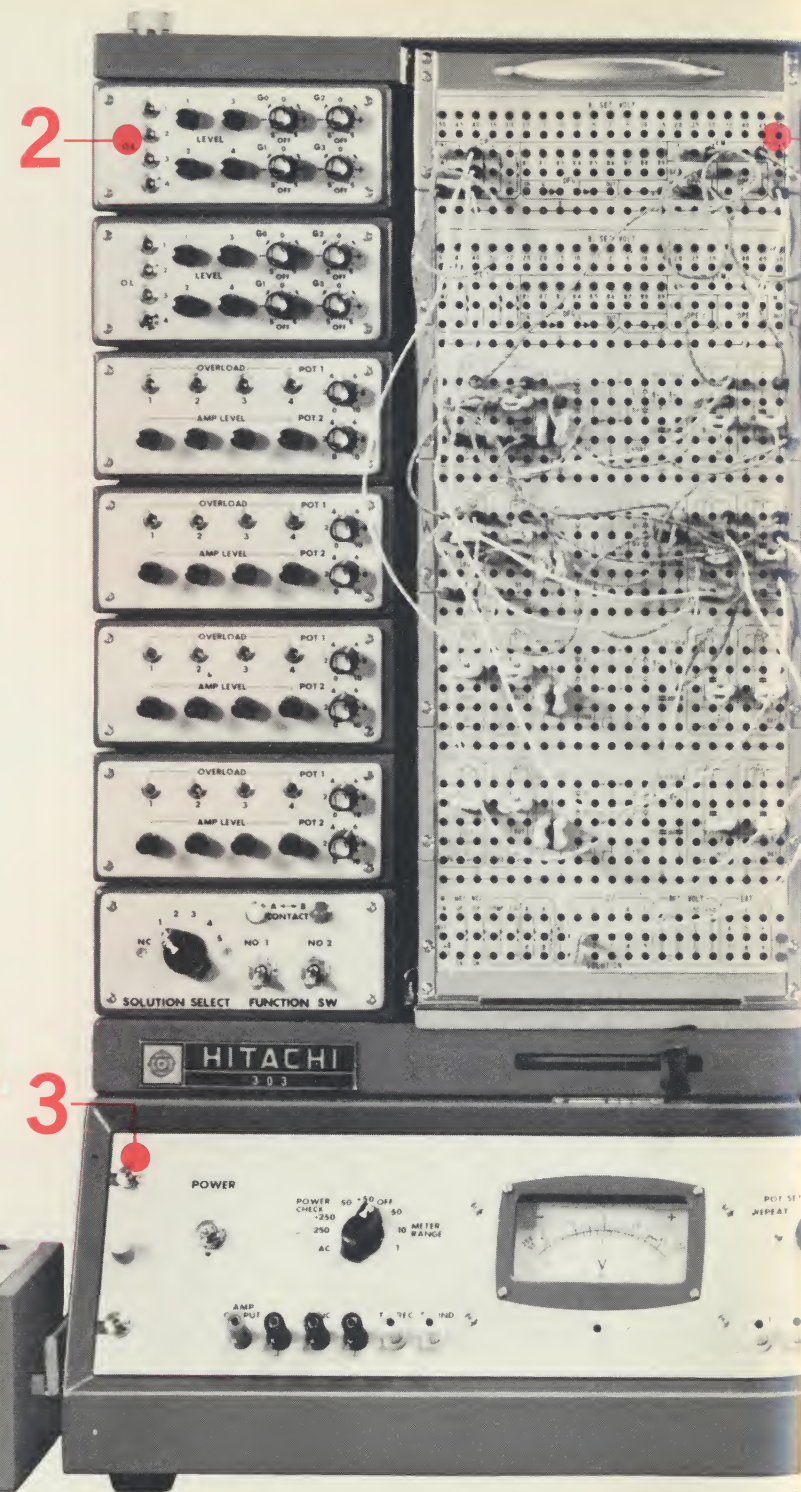
Item	Type	HITACHI 303														
		10	20	11	30	21	40	31	22	50	41	32	60	51	42	33
Control panel	CT-121	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Linear panel	LA-121	1	2	1	3	2	4	3	2	5	4	3	6	5	4	3
Non-linear panel	NA-122			1		1		1	2		1	2		1	2	3
Demonstrator	DS-121	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Power supply for extension	PS-021						1	1	1	1	1	1	1	1	1	1
Accessories		1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set

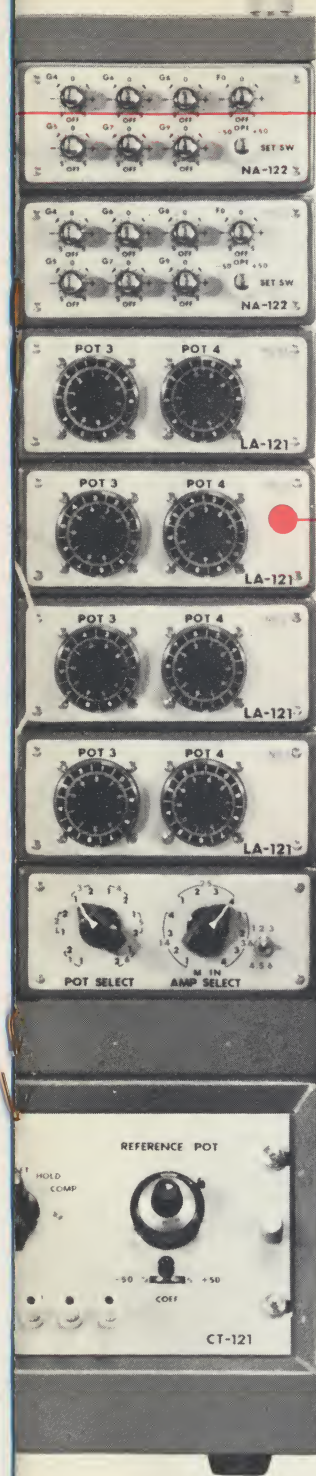
Note: It is possible to connect the following output devices to all standard models optionally.

RA-121 recorder

V-104 synchroscope

RA-121
Recorder



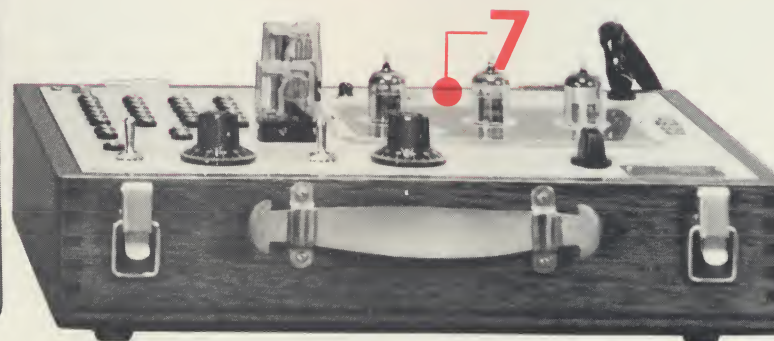


B

HITACHI 303-42 Analog Computer

C

V-104 Synchroscope



A RA-121
1 One channel heat pen recorder

B HITACHI 303-42
2 NA-122, nonlinear panel including:
1ea. Diode function generator
1ea. Multiplier/divider
2ea. Inverter/high gain amplifiers
1ea. Comparator
3 CT-121, control panel including:
Readout meter and selecting switch
Reference potentiometer
Mode control switch
Output terminals and others
4 Pre-patch board
5 LA-121, linear panel including:
2ea. Summing/high gain amplifiers
2ea. Summing integrator/summing amplifiers
2ea. Ten turn potentiometers
2ea. One turn potentiometers
4ea. Free silicon diodes

D DS-121
Demonstrator

C V-104
6 A 5-inch oscilloscope is used for indicating solutions in repetitive operation.

D DS-121
7 An operational amplifier, several computing components, potentiometers and relays are installed here which are used for explanations of integrator, summing amplifier and other functions.

Features

FOR EDUCATIONAL USE-

1) A demonstrator is provided for explanations of various computing elements

The operational amplifier and associated computing components are installed in the demonstrator. It is possible to learn fundamental operations of integrator, adder etc. by terminal connections of each component arranged on top of this panel.

Control of operation mode can be performed independently by means of a rotary switch set on the demonstrator panel.

2) A pre-patch board, which eases programming by graph, is provided

The terminal layout of computing components on the removable prepatch board is easily understandable with a graphic arrangement and eases programming. Since the programmed patch board can be removed from the computer and stored as it is, a demonstration of various kinds of solutions to the students is made possible by changing patch boards in turns if various problems are programmed beforehand. By a method such as this, the students may be able to understand solutions of transient phenomena of electric circuits, mechanical vibration systems and automatic control system by visual indication.

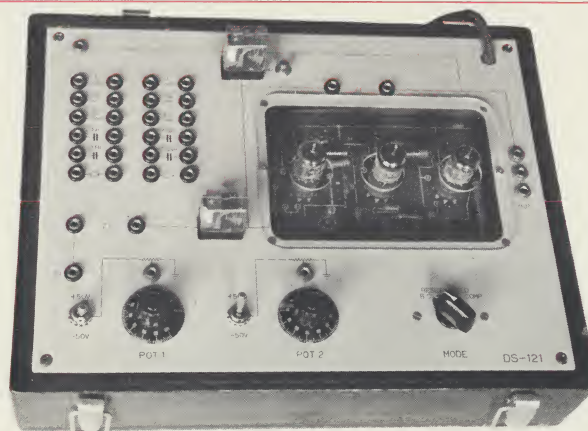
3) Suitable for educating a great number of people

By preparing many pre-patch boards it is possible for a great number of people to perform programming exercises simultaneously with one computer, thereby raising educational efficacy considerably.

4) Double trace mechanism is stored inside

A double trace mechanism is stored inside for producing 2 solutions by switching them over alternately in the computer control panel in order to indicate 2 solutions even though one channel oscilloscope is used.

DS-121,
Demonstrator



FOR RESEARCH AND DESIGN USE-

1) Dual time scale operation is available

Either one-shot or repetitive operation is controlled by manipulating the mode control switch. The one-shot operation is effective for highly accurate computation and the repetitive operation for model building.

2) Well-equipped operational control and check system

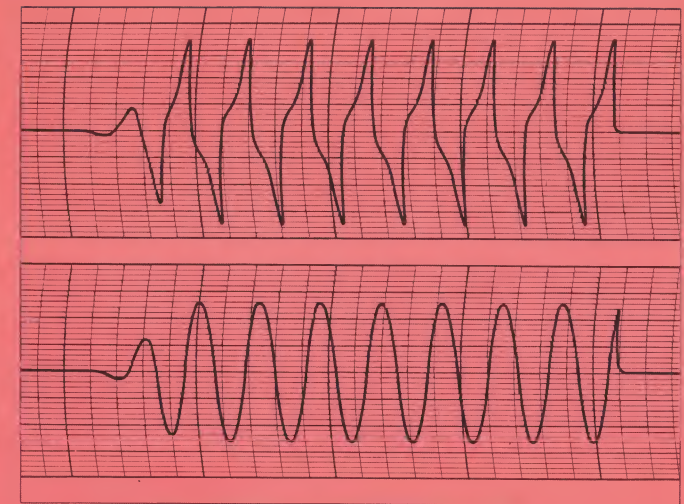
The reference potentiometer, function switch, mode control switch and large size monitor meter are laid out in a manner which eases operation considerably. Again, by resetting the patch board from the lock position, balance checking of all amplifiers is performed simultaneously; the neon indicator lamps on each amplifier are lit in case the balance of the amplifier deviates from its proper position.

3) Multiplier which needs no adjustment

It is not necessary to make balance adjustment as this is a quarter (1/4) square multiplier using a diode square function generator. As one amplifier is installed within, this multiplier works as a four-input multiplier without the necessity of additional amplifiers.

4) Ease of setting function generator

Since the set-up of slope is of an independent type, or the slope can be set without interfering with other slopes, even complicated functions can be generated with ease through the use of the Hitachi 303 function generator.



Solution of Van der Pol equation

Specifications

BASIC SPECIFICATIONS

COMPUTING VOLTAGE: ± 50 volts
ACCURACY OF COMPUTING COMPONENTS: $\pm 0.5\%$
AMPLIFIER DRIFT: 10 millivolts/hour at unity gain
PATCH BOARD
CONSTRUCTION: Pre-patch type
TEMPERATURE RANGE: 5°C to 30°C^*
HUMIDITY: 50% to 80% relative humidity*
CONSTRUCTION: Modular, portable
POWER REQUIREMENTS: AC, single phase, 110V, 60 cycles
400 watts (fully expanded)

NOTE: * THE ABOVE CONDITIONS ARE NECESSARY TO SATISFY THE DESIGN SPECIFICATIONS.

INDIVIDUAL SPECIFICATIONS

OPERATIONAL AMPLIFIER:

DC gain: 70 db. approx.
DC drift: 10 mV/hour, at unity gain
Maximum computing voltage: $\pm 50\text{V}$
Maximum output current: $\pm 3\text{mA}$

SUMMING AMPLIFIER/HIGH GAIN AMPLIFIER:

Accuracy of computing components: $\pm 0.5\%$
Input terminals: 10, 1, 1, 1, F and grid
Function change: Patching on problem board

SUMMING INTEGRATOR/SUMMING AMPLIFIER:

Accuracy of computing components: $\pm 0.5\%$
Input terminals: 10, 1, 1, 1, F, grid and initial condition
Function change: Patching on problem board

TEN TURN POTENTIOMETER:

Resistance: 50 kilo ohms
Setting accuracy: $\pm 0.4\%$

ONE TURN POTENTIOMETER:

Resistance: 100 kilo ohms
Setting accuracy: $\pm 0.4\%$

FREE DIODE:

Used to make up special non-linear elements such as saturation, dead zone and backlash.

DIODE FUNCTION GENERATOR:

Number of segments: 10
Slope of segments: 0 to $\pm 5\text{V/V}$
Setting of slope: By potentiometer on the panel
Setting of breakpoint: Patching on problem board in 5V segments
Amplifiers: Not included

MULTIPLIER/DIVIDER

System: Quarter square method
Input: X, $-X$, Y, $-Y$, or X, $-X$, Z
Output: $-XY/50$, or $-50 Z/X$
Accuracy: $\pm 2\%$
Amplifier: Included

COMPARATOR:

Transfer junction: Four circuits
Amplifier: Included



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Codes: All Codes Used

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